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Comparison of Models for the Dielectric Constant of Seawater and Fresh Water

The following graphs compare models from various sources for the dielectric constant of water; the emissivity of a flat surface computed from the Fresnel equations is plotted at 275 and 295 K. A linear-with-frequency baseline was subtracted, to allow an expanded vertical scale. The curve labeled FASTEM is a model from S. English which uses the Lamkaouchi et al. dielectric constant, and adds a parameterization for surface roughness. That parameterization is slightly negative at zero wind speed, which is the plotted condition.

The Klein-Swift and Guillou et al. models are single Debye curves and therefore have been limited to < 40 GHz; the other models are double-Debye. Some of the models include dependence on salinity S, and these are compared with the fresh-water model of Liebe et al. in the graphs for S=0.

The stand-alone microwave forward model has a modified version of FASTEM that uses the Guillou et al. model (with S=0.035) below 50 GHz, and Lamkaouchi et al. at higher frequencies. It does not differentiate between sea water and fresh water.

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